

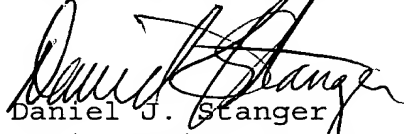
The Applicants filed a Reply, a Petition for Extension of Time, and a credit card payment form including the appropriate fee due on January 2, 2004, as January 1, 2004 was a Federal holiday. Enclosed is a copy of the documents submitted along with a copy of the mailroom date-stamped receipt, showing receipt of the documents on January ⁸~~2~~, 2004.

January 429.00 00

Accordingly, the Applicants request that the holding of abandonment be withdrawn.

Although the Applicants believe that no fee should be due, the Commissioner is hereby authorized to charge any fee associated with this Request to Deposit Account No. 50-1417.

Respectfully submitted,


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Date: May 7, 2004



H-961

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In re Patent Application of

T. HIROSE et al

Serial No. 09/774,723

Group Art Unit: 2623

Filed: February 1, 2001

Examiner: V. Bali

For: POLISHING PAD SURFACE CONDITION EVALUATION METHOD AND AN
APPARATUS THEREOF AND A METHOD OF PRODUCING A
SEMICONDUCTOR DEVICE

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MAY 11 2004

Papers Filed Herewith:

Transmittal Letter;

REPLY;

PETITION FOR EXTENSION OF TIME; and

Credit Card Payment form in the amount of \$420.00

In payment of Two-month Extension of Time Fee.

Technology Center 2600

Receipt is hereby acknowledged of the papers filed, as
identified in connection with the above-identified patent
application.

COMMISSIONER OF PATENTS AND TRADEMARKS

In RE application of T. HIROSE et al

Serial No.: 09/774,723

Group Art Unit: 2623

Filed: February 1, 2001

Examiner: V. Bali

For: POLISHING PAD SURFACE CONDITION EVALUATION METHOD AND AN
APPARATUS THEREOF AND A METHOD OF PRODUCING A SEMICONDUCTOR
DEVICE

Assistant Commissioner for Patents
Washington, D.C. 20231

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MAY 11 2004

Technology Center 2600

Sir:

Transmitted herewith is an Amendment in the above-identified application.

- ☐ Small entity status of this application under 37 CFR 1.9 and 1.27 has been established by a verified statement previously submitted.
- ☐ A verified statement to establish small entity status under 37 CFR 1.9 and 1.27 is enclosed.
- ☐ No additional fee is required.

The fee has been calculated as shown below:

(COL. 1)		(COL. 2)	(COL. 3)
Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra
Total	25	Minus	25 = 0
Indep.	4	Minus	7 = 0
<input type="checkbox"/> First Presentation of Multiple Dependent Claims			

SMALL ENTITY	
Rate	Additional Fee
x 9	\$
x 42	\$
+ 140	\$
Total	\$

OTHER THAN A SMALL ENTITY	
Rate	Additional Fee
x 18	\$ 0
x 84	\$ 0
+ 280	\$ 0
Total	\$ 0

- * If the entry in Col. 1 is less than the entry in Col. 2, write '0' in Col. 3.
- ** If the 'Highest Number Previously Paid For' IN THIS SPACE is less than 20, write '20' in this space.
- *** If the 'Highest Number Previously Paid For' IN THIS SPACE is less than 3, write '3' in this space.
- The 'Highest Number Previously Paid For' (Total or Independent) is the highest number found from the equivalent box in Col. 1 of a prior Amendment or the number of claims originally filed.

- ☐ Please charge my Deposit Account No. 50-1417 in the amount of \$ _____.
- ☒ *credit card Payment Form*
A ~~check~~ in the amount of \$ 420.00 is attached in payment of:
Two-month Extension of Time Fee.
- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 50-1417.
- ☒ Any filing fees under 37 CFR 1.16 for the presentation of extra claims.
- ☒ Any patent application processing fees under 37 CFR 1.17.
- ☒ Any Extension of Time fees that are necessary, which are hereby requested if necessary.

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By:

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Attorney for Applicant(s)

Date: January 2, 2004



H-961

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

T. HIROSE et al

Serial No. 09/774,723

Group Art Unit: 2623

Filed: February 1, 2001

Examiner: V. Bali

For: POLISHING PAD SURFACE CONDITION EVALUATION METHOD AND AN
APPARATUS THEREOF AND A METHOD OF PRODUCING A
SEMICONDUCTOR DEVICE

RECEIVED

REPLY

MAY 11 2004

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Technology Center 2600

January 2, 2004

Sir:

In response to the Office Action dated August 1, 2003,
please amend the above-identified application as follows. A
petition and fee for a two-month extension of time accompany
this Reply.

IN THE CLAIMS

1. (Withdrawn) A method for evaluating polishing pad surface conditions comprising the following steps:

removing polishing fluid adhered to a polishing pad surface for at least an area of said polishing pad surface;

illuminating with light said area of said polishing pad surface from which said polishing fluid was removed;

detecting light reflected from said polishing pad surface due to said illuminating light;

evaluating deterioration of said polishing pad surface based on an intensity signal of said detected reflected light; and

displaying results from said evaluation on a monitor.

2. (Withdrawn) A method for evaluating polishing pad surface conditions as described in claim 1 wherein an area of said polishing pad illuminated by said light is moved successively.

3. (Previously Presented) A method for evaluating polishing pad surface conditions as described in claim 5, wherein removal of polishing fluid adhered to said polishing

pad surface is performed by flowing gas onto said polishing pad surface.

4. (Withdrawn) A method for evaluating polishing pad surface conditions as described in claim 1 further comprising a step for outputting information of said evaluation results to conditioning means for said polishing pad.

5. (Currently Amended) A method for evaluating polishing pad surface conditions comprising the following steps:

removing polishing fluid adhered to a polishing pad surface for at least an area of said polishing pad surface;

illuminating with light said area of said polishing pad surface from which said polishing fluid was removed;

imaging said illuminated area by an optical imaging unit and obtaining an image of said polishing pad surface;

evaluating deterioration of said polishing pad surface ~~based on~~ by processing said surface image; and

displaying results from said evaluation on a monitor.

6. (Original) A method for evaluating polishing pad surface conditions as described in claim 5 wherein said image

is digitized and said digitized image is used to evaluate deterioration of said polishing pad surface.

7. (Original) A method for evaluating polishing pad surface conditions as described in claim 5 wherein bi-level conversion is performed on said image to obtain a bi-level image and an area ratio of said bi-level image is used to evaluate deterioration of said polishing pad surface.

8. (Original) A method for evaluating polishing pad surface conditions as described in claim 5 further comprising a step for outputting information of said evaluation results to conditioning means for said polishing pad.

9. (Previously Presented) A method for evaluating polishing pad surface conditions as described in claim 5, further comprising the following steps:

detecting fluorescence generated by said polishing pad due to said illumination;

further evaluating deterioration of said polishing pad surface based on an intensity signal of said detected fluorescence; and

outputting results from said evaluation based on the intensity signal.

10. (Previously Presented) A method for evaluating polishing pad surface conditions as described in claim 9, wherein a fluorescence image is obtained from the fluorescence generated by said polishing pad; and deterioration due to contaminants on said polishing pad surface is evaluated based on said fluorescence image.

11. (Previously Presented) A method for evaluating polishing pad surface conditions as described in claim 9, wherein said information of said evaluation results is displayed on a display.

12. (Withdrawn) A device for evaluating polishing pad surface conditions comprising:

means for removing polishing fluid removing polishing fluid adhered to at least an area of a polishing pad surface;

means for illuminating using light to illuminate said area on said polishing pad surface from which said polishing fluid was removed b said polishing fluid removing means;

means for detecting reflected light detecting light reflected from said polishing pad surface illuminated by said illuminating means;

means for evaluating ~~evaluating~~ deterioration of said polishing pad surface based on an intensity signal of reflected light detected by said reflected light detecting means; and

means for displaying ~~displaying~~ information of results from said evaluation.

13. (Withdrawn) A device for evaluating polishing pad surface conditions as described in claim 12 wherein: said illuminating means and said polishing means move relative to each other; and an illumination area on said polishing pad from said light moves successively.

14. (Previously Presented) A device for evaluating polishing pad surface conditions as described in claim 16, wherein said polishing fluid removing means removes polishing fluid adhered to said polishing pad surface by blowing a gas onto said polishing pad surface.

15. (Withdrawn) A device for evaluating polishing pad surface conditions as described in claim 12 further comprising means for ~~outputting-outputting~~ information from said evaluation results to conditioning means for said polishing pad.

16. (Currently Amended) A device for evaluating polishing pad surface conditions comprising:

means for removing polishing fluid adhered to at least an area of a polishing pad surface;

means for ~~using light to illuminate~~ illuminating said area on said polishing pad surface from which said polishing fluid was removed by said polishing fluid removing means;

means for capturing images ~~imaging an~~ of said area illuminated by said illuminating means and obtaining an image of said polishing pad surface;

first evaluating means for evaluating deterioration of said polishing pad surface ~~based on an~~ by processing said image of said polishing pad surface obtained through said image capturing means; and

first outputting means for outputting information of results from said evaluating means.

17. (Original) A device for evaluating polishing pad surface conditions as described in claim 16 wherein said evaluating means digitizes said image obtained through said image capturing means and said digitized image is used to evaluate deterioration of said polishing pad.

18. (Original) A device for evaluating polishing pad surface conditions as described in claim 16 wherein: said evaluating means performs bi-level conversion on said image obtained through said image capturing means to provide a bi-level image; and deterioration of said polishing pad surface is evaluated based on an area ratio of said bi-level image.

19. (Currently Amended) A device for evaluating polishing pad surface conditions as described in claim 16 further comprising means for outputting ~~outputting~~ information of results from said evaluation to conditioning means for said polishing pad.

20. (Previously Presented) A device for evaluating polishing pad surface conditions as described in claim 16, further comprising:

means for detecting fluorescence generated by said polishing pad due to illumination from said illuminating means;

second evaluating means for evaluating deterioration of said polishing pad surface based on an intensity signal of fluorescence detected by said fluorescence detecting means; and

second outputting means for outputting information of results from said evaluation.

21. (Previously Presented) A device for evaluating polishing pad surface conditions as described in claim 20, wherein said fluorescence detecting means obtains a fluorescence image; and said second evaluating means evaluates deterioration of said polishing pad surface due to contaminants based on the fluorescence image obtained by said fluorescence detecting means.

22. (Previously Presented) A device for evaluating polishing pad surface conditions as described in claim 20, wherein said second outputting means displays information of results evaluated by said second evaluating means to a display.

23. (Withdrawn) A method for producing thin-film devices comprising the following steps:

forming a thin film on a substrate;

planarizing a surface of said substrate by polishing said substrate surface on which said thin film is formed using a polishing pad;

cleaning said planarized substrate; and

applying a resist to said cleaned substrate and exposing a pattern;

wherein said planarizing step includes steps for evaluating surface conditions of the polishing pad according to the method claimed in claim 5.

24. (Withdrawn) A method for producing thin-film devices as described in claim 23 wherein, in said planarizing step, an optical image of said polishing pad surface is detected from reflected light from said polishing pad, and surface deterioration of said polishing pad is evaluated based on said detected optical image.

25. (Withdrawn) A method for producing thin-film devices as described in claim 23 wherein, in said planarizing

step, evaluation of deterioration of said polishing pad surface and restoration of said surface condition of said polishing pad based on said results from said evaluation are performed while said substrate surface is being polished using said polishing pad.

REMARKS

The Applicants request reconsideration of the rejection.

Claims 1-25 are pending. Claims 1-2, 4, 12-13, 15, and 23-25 have been withdrawn from consideration. Therefore, claims 3, 5-11, 14, and 16-22 have been examined.

Claims 3, 5-11, 14, and 16-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Birang U.S. Patent No. 5,708,506 (Birang).

In a Restriction Requirement dated November 15, 2002, the Examiner determined that the following inventions constitute patentably distinct inventions which could not be examined together:

Group I, drawn to a device and a method for evaluating polishing pad surface condition by illuminating with light of the areas of polishing pad surface and detecting a reflected light from the surface due to the illuminating light;

Group II, drawn to a device and a method for evaluating polishing pad surface condition by imaging the illuminated areas of polishing pad surface based on surface image; and

Group III, drawn to a device and a method for evaluating polishing pad surface condition by detecting fluorescence generated by the polishing pad.

The Examiner determined that the invention of Group I must be restricted from that of Group II because it has separate utility in that the evaluating step does not include an imaging process which requires a camera. The Examiner also determined that the invention of Group I has separate utility from that of Group III in that the evaluating step requiring the excitation and detection of fluorescence from the polishing pad, which requires a camera, is not required by Group I.

Pursuant to the Restriction Requirement, the Applicants elected the invention of Group II, such that each claim is now limited by means or steps for evaluating and detecting by an imaging process.

In the current Office Action, the Examiner recognizes that Birang fails to disclose imaging the surface, as set forth on page 3 of the Office Action. However, the Examiner finds that Birang's teaching of generating a signal indicating the intensity of scattered light detected "means that the image is observed by the system." Office Action at page 3. In accordance with this determination, the Examiner finds that the claimed invention is obvious over the teachings of Birang.

Respectfully, this determination directly conflicts with the prior determination that the imaging of the polishing pad

surface is a separate, patentably distinct invention from that of simply detecting intensity from light scattered by the surface. Note that Birang neither teaches nor fairly suggests that an image is derived from the scattered light. Rather, Birang teaches only that the light input to the detector is converted to a voltage signal, which is compared to a predetermined voltage level to determine whether the conditioning process (not the deterioration of the pad) has reached an acceptable result. Accordingly there is no teaching in Birang to image the pad surface, and the imaging cannot be considered to be obvious in light of the intensity detection taught by Birang.

Thus, independent claim 5 is patentable over Birang at least in view of the requirement of a step of "imaging said illuminated area... and obtaining an image of said polishing pad surface;" and the step of "evaluating deterioration of said polishing pad surface [based on] said surface image."

To further emphasize these patentable features of the invention, the imaging step has been amended to require it to be performed by an optical imaging unit. The evaluating step has also been amended, to require that the evaluation be made by processing the surface image. It is noted, again, that Birang does not teach to image the illuminated area of the

polishing pad surface, or to evaluate the deterioration of the polishing pad surface. Rather, Birang teaches to detect light intensity from the illuminated area, in the course of evaluating the conditioning of the polishing pad surface.

Birang does not teach to monitor the deterioration of the polishing pad surface.

In light of the lack of teaching to image the illuminated area, the limitations of dependent claims 6 and 7 provide separate patentability. Claim 6 requires that the image be digitized and used to evaluate the deterioration of the polishing pad surface. Claim 7 requires that bi-level conversion be performed on the image to obtain a bi-level image, and an area ratio of the bi-level image is used to evaluate deterioration of the polishing pad surface.

Further, dependent claim 8 requires a step of outputting information of the evaluation of the deterioration to the conditioning means for the polishing pad. In the passage noted by the Examiner, Birang teaches to terminate the conditioning process performed by the conditioning means when the evaluation of the conditioning process indicates that the pad has reached an acceptable level of conditioning. In contrast, the invention as claimed in claim 8 provides the conditioning means with results of deterioration of the pad

which, as noted previously, is not a concern of the process taught by Birang.

Dependent claim 9 requires an additional step of detecting fluorescence generated by the polishing pad due to the illumination, and further evaluating the deterioration of the polishing pad surface based on an intensity signal of the detected fluorescence, wherein results of the evaluation based on the intensity signal are also output. In other words,

object { according to claim 9, the invention provides evaluation results of two evaluation parameters (imaging and fluorescence-generated intensity). The Examiner appears to indicate obviousness of the fluorescence generation based on the perceived knowledge that a florescent light source is known to the art; however, the invention of claim 9 is not limited simply by the type of light source, but by the generation of fluorescence by the polishing pad due to illumination of the pad surface. The results of the fluorescence, combined with the results of the imaging, are used in determining the deterioration of the pad according to claim 9.

Dependent claim 9 requires that a fluorescence image be obtained from the generated fluorescence, and deterioration due to contaminants on the polishing pad surface be evaluated


based on the fluorescence image. Birang is not interested in deterioration of the pad surface, but in the conditioning of the surface. Therefore, there is no evaluation in Birang based on contaminants on the polishing pad surface.

In accordance with these arguments, independent claim 16 is now seen to be patentably distinguishable from Birang. Claim 16 recites, among other features, means for capturing images of the area illuminated by the illuminating means and obtaining an image of the polishing pad surface, and first evaluating means for evaluating deterioration of the polishing pad surface by processing the image of the polishing pad surface obtained through the image capturing means.

In line with the above arguments, dependent claims 17-22 (each dependent from claim 16) are seen to be separately patentable.

In view of the foregoing amendments and remarks, the Applicants request reconsideration of the rejection and allowance of the claims.

Respectfully submitted,



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Date: January 2, 2004



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In re Patent Application of

T. HIROSE et al

Serial No. 09/774,723

Group Art Unit: 2623

Filed: February 1, 2001

Examiner: V. Bali

For: POLISHING PAD SURFACE CONDITION EVALUATION METHOD AND AN
APPARATUS THEREOF AND A METHOD OF PRODUCING A
SEMICONDUCTOR DEVICE

PETITION FOR EXTENSION OF TIME

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

January 2, 2004

Sir:

It is respectfully requested that a Two-month Extension of Time, to and including January 1, 2004, be granted in which to respond to the Office Action dated August 1, 2003 in the above-identified application.

Our Credit Card Payment Form in the amount of \$420.00 is attached in payment of the appropriate fee.

The Commissioner is hereby authorized to charge any additional payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

Respectfully submitted,

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